

**TRIGGER FOCUS GROUP
RECOMMENDATION # ~~67~~
FLOW AND LOAD CALCULATIONS**

~~June 12, 2006~~
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OBJECTIVE: Accurate flow measurements are is important to the Irrigated Lands Program in order to be able to assess the magnitude of waste discharged to surface waters, and to be able to evaluate the impact of pollutants that are detected as concentrations, from waterbodies of varying sizes and flows. In order to be able to do this achieve these goals, it is necessary to have accurate flow data. is necessary. From the accurate concentration and flow data, load values shall be calculated where necessary and appropriate. The objective of this requirement is to obtain flow measurements at Coalition monitoring sites to determine the quantity (loads) of pesticides or other constituents discharged into waterbodies during the irrigation season.

PROBLEM STATEMENT: The compliance monitoring section of the draft Coalition Group monitoring MRP states the following:

“Representative flow measurements shall be obtained at each sample location during each sampling event. Additionally, the presence or absence of flow at each sample site shall be noted at a sufficient frequency to determine the quantity discharged during the irrigation season. The MRP Plan shall record the time, date and location of each flow measurement or observation (absences) on field data sheets. Discharge flow monitoring shall be reported in cubic feet per second (cfs).

Stream flow or discharge is defined as the rate at which a volume of water flows past a point over some unit of time (i.e, cubic feet per second). The major technical issue associated with this stream flow requirement is the number of flow measurements that can be taken at a stream site in order to accurately determine the flow. The USGS method is generally considered the most accurate method of determining flow at a site. This method requires taking numerous flow measurements (~ 20 for some sites with adequate stream width) at different depths and distances from the stream bank (Church et al. 1999).- These measurements ~~can only be~~ are generally taken in wadeable streams although sampling from bridges is also an option-. It was estimated by Trigger Focus Group members (June 6, 2005 conference call) that for some Coalitions only 25% of the sites are wadeable and therefore appropriate for the USGS method. For other sites only a few flow measurements can be taken near the stream bank. In order to determine the uncertainty that would be associated with taking only a few flow measurements at a site, Mike Johnson (University of California Davis and Trigger Focus Group member) compared flow measurements from 8 randomly selected stream sites in the Central Valley using the USGS method and one to four flow measurements across the channel (Attachment A).- Mike’s results using four different flow scenarios with four

measurements or less showed that flow was statistically different (lower) for all cases when compared with the USGS method. In summary, using only a few flow measurements at a site can not accurately determine flow. Therefore, any constituent load calculation based on flawed flow measurements will have a high degree of uncertainty and likely underestimate constituent loading to a water body.

FOCUS GROUP RECOMMENDATION:

When possible the USGS method should be used at all wadeable and nonwadeable stream sites for accurately determining flow. If ~~streams are not wadeable and~~ the USGS method can-not be used then flow measurements should be taken near the stream bank of the site or the float method can be used (Harrington and Born, 2000). The approximate location and number of stream flow measurements should be documented on the data sheets. Photo documentation should also be used at these sites. Data files for flow data should contain a comment column that will allow a flag for flow measurements that have a high degree of uncertainty. Flow data with a high degree of uncertainty should not be used for pesticide (or other constituent) loading calculations.

REFERENCES

Church, P. E., G. E. Granato, and D. W. Owens. 1999. Basic requirements for collecting, documenting, and reporting precipitation and stormwater-flow measurements. United States Geological Survey. Report 99-255, Northborough, Massachusetts.

Harrington, J. and M. Born. 2000. Measuring the health of California streams and rivers – A methods manual for water resource professionals, citizen monitors and natural resource students. Report. Sustainable Land Stewardship International Institute, Sacramento, California.

Attachment A - Comparison of discharge calculations (in cfs)

		<u>USGS-method</u>	<u>1st (1st intervall used for all)</u>	<u>2nd (2nd intervall used for all)</u>	<u>2/2 (2 most outer intervalls used)</u>	<u>1-3 (intervall 1-3 on one side used)</u>
1	Site 1	<u>3.97</u>	<u>0.56</u>	<u>1.11</u>	<u>3.11</u>	<u>1.45</u>
2	Site 2	<u>11.79</u>	<u>11.43</u>	<u>12.01</u>	<u>11.59</u>	<u>10.4</u>
3	Site3	<u>48.47</u>	<u>3.07</u>	<u>9.61</u>	<u>9.32</u>	<u>12.21</u>
4	Site4	<u>5.94</u>	<u>0</u>	<u>0</u>	<u>1.22</u>	<u>3.14</u>
5	Site 5	<u>41.56</u>	<u>13.71</u>	<u>32.74</u>	<u>15.19</u>	<u>35.94</u>
6	Site 6	<u>70.28</u>	<u>35.27</u>	<u>68.86</u>	<u>63.91</u>	<u>27.65</u>
7	Site 7	<u>44.05</u>	<u>0</u>	<u>17.93</u>	<u>19.97</u>	<u>16.04</u>
8	Site 8	<u>75.7</u>	<u>30.64</u>	<u>68.31</u>	<u>58.3</u>	<u>52.64</u>

very small creek, USGS method
used only 5 intervals

p = 0.0075

p = 0.0519

p = 0.0205

p = 0.0198